



Organic Chemistry Revision Sheets

Alkanes | Free Radical Substitution

Reaction

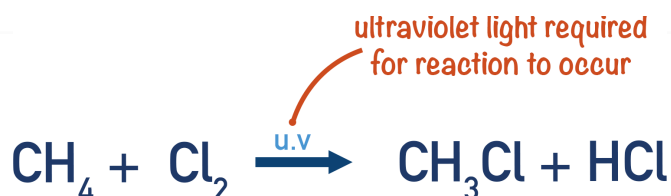
REACTANTS: Alkane and Halogen

CONDITIONS: U.V (ultraviolet) light

PRODUCT(S): Halogenoalkane and Hydrogen Halide

REACTION TYPE: Free Radical Substitution

REACTION:
(example of
methane and
chlorine)

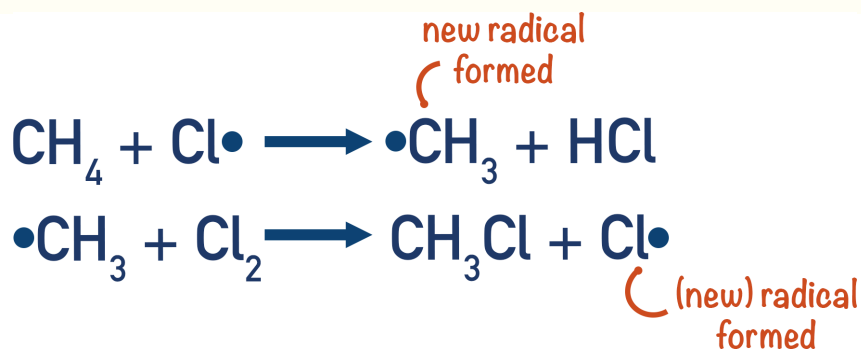


Mechanism

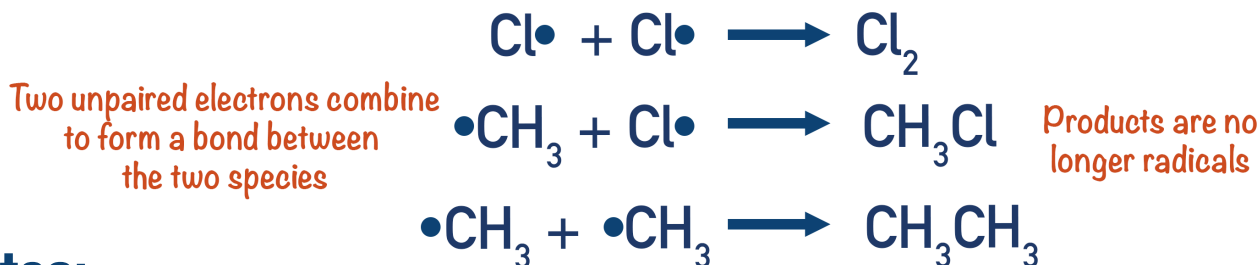
INITIATION STEP: Halogen molecule undergoes heterolytic fission to form radical species:



PROPAGATION STEP: Radical species reacts with alkane to form alkyl radical and HCl. Alkyl radical then reacts with halogen molecule, reforming another halogen radical, creating a **chain reaction**:



TERMINATION STEP: Radical species combine to end chain reaction:



Notes:

- Heterolytic fission is the even breaking of a covalent bond (each bonded atom gets an electron and becomes a radical species).
- UV light provides the energy required for heterolytic fission.
- Further substitution reactions can occur, eventually forming tetrachloromethane:
chloromethane to dichloromethane to trichloromethane to tetrachloromethane